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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/586,193	05/05/2008	Oleg Sulima	857_043	4885
25191	7590	11/24/2009	EXAMINER	
BURR & BROWN			ERDEM, FAZLI	
PO BOX 7068			ART UNIT	
SYRACUSE, NY 13261-7068			PAPER NUMBER	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/586,193	<b>Applicant(s)</b> SULIMA, OLEG	
	<b>Examiner</b> FAZLI ERDEM	<b>Art Unit</b> 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 30 July 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-49 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 19, 21-36, 43-45, 48 and 49 is/are rejected.
- 7) ☒ Claim(s) 11-18, 20, 37-42, 46 and 47 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>4/16/2009</u> .   | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Response to Arguments*

Applicant's arguments filed 7/30/2009 have been fully considered but they are not persuasive.

On page 2, second paragraph, of the remarks filed on 7/30/2009, applicant asserts that Razeghi '242 does not disclose a phototransistor. However, at column 5 line 10 Razeghi states, "A possible third type of structure is an npn (or pnp) **phototransistor**" (emphasis added).

On page 2, third paragraph, of the remarks filed on 7/30/2009, applicant asserts that Razeghi fails to disclose n or p doping. However, at column 5 line 10 Razeghi states, "A possible third type of structure is an **nnp** (or **pnnp**) phototransistor" (emphasis added).

On page 3, first and second paragraphs, of the remarks filed on 7/30/2009, applicant asserts that Razeghi fails to disclose a phototransistor with an emitter, a base, and a collector. However, at column 5 line 10 Razeghi states, "A possible third type of structure is an npn (or pnp) **phototransistor**" (emphasis added). Those of skill in the art would understand that an emitter, a base, and a collector are all **physically necessary** to produce a functioning phototransistor. These elements are thus **inherent** in Razeghi's disclosure of "an npn (or pnp) phototransistor". See MPEP 2112 ("Requirements of Rejection Based on Inherency").

On page 4, fourth paragraph and page 5, first paragraph, applicant argues that there does not exist a motivation to combine Razeghi '242 and Taira '771 references.

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However, column 1, lines 50-55 of Taira discloses that the structure of Taira '771 results in improved saturation characteristics and simplified fabrication process. Examiner considers this enough motivation to combine Razeghi '242 and Taira '771 references.

***Allowable Subject Matter***

Claims 11-18, 20, 37-42, 46 and 47 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Prior art failed to establish claimed materials and base bandgap gradient.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 19, 21-24, 26-34, 48 and 49 are rejected under 35 U.S.C. 102(b) as being anticipated by Razeghi (6,452,242).

Regarding Claim 1, Razeghi teaches a phototransistor comprising a substrate comprising antimony (column 2, lines 29-30), an emitter comprising antimony; a base comprising antimony, said base comprising an emitter-contacting portion which is in contact with a base-contacting portion of said emitter; and a collector comprising antimony, said collector comprising a base-contacting portion which is in contact with a

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collector-contacting portion of said base, said phototransistor producing an internal gain upon being contacted with light within a receivable wavelength range (column 5, lines 10-16)

Regarding Claim 2, in Razeghi in claim 1 it is disclosed that the emitter, the base and the collector are each substantially lattice-matched.

Regarding Claim 19, Razeghi teaches that emitter-contacting portion of base comprises a first bandgap value and said base-contacting portion of said emitter comprises a second bandgap value, said first bandgap value being less than said second bandgap value as disclosed in Fig. 1

Regarding Claim 21, in Fig 1 of Razeghi it is disclosed that collector-contacting portion of said base has a third bandgap value, said second bandgap value being substantially equal to said third bandgap value.

Regarding Claim 22, in Fig. 1 of Razeghi it is disclosed that collector-contacting portion of said base has a third bandgap value, said second bandgap value being greater than a said third bandgap value.

Regarding Claim 23, in Fig. 1 of Razeghi substrate is labeled as "substrate".

Regarding Claim 24, in Fig. 1 of Razeghi substrate comprises antimony (Sb) column 2, lines 29-30.

Regarding Claim 26, wherein said substrate consists essentially of GaSb or InGaSb.

Regarding Claims 27 and 28, in column 5 of Razeghi pnp or npn transistor device is disclosed.

Regarding Claim 29, in Fig. 2 of Razeghi, 29, receivable wavelength range is from 1.8 micrometers to 2.5 micrometers.

Regarding Claim 30, Razeghi teaches a phototransistor comprising a substrate comprising antimony (column 2, lines 29-30), an emitter comprising antimony; a base comprising antimony, said base comprising an emitter-contacting portion which is in contact with a base-contacting portion of said emitter; and a collector comprising antimony, said collector comprising a base-contacting portion which is in contact with a collector-contacting portion of said base, said phototransistor producing an internal gain upon being contacted with light within a receivable wavelength range (column 5, lines 10-16)

Regarding Claim 31, Razeghi teaches a phototransistor comprising a substrate comprising antimony (column 2, lines 29-30), an emitter comprising antimony; a base comprising antimony, said base comprising an emitter-contacting portion which is in contact with a base-contacting portion of said emitter; and a collector comprising antimony, said collector comprising a base-contacting portion which is in contact with a collector-contacting portion of said base, said phototransistor producing an internal gain upon being contacted with light within a receivable wavelength range (column 5, lines 10-16)

Regarding Claim 32, Razeghi teaches metal-organic chemical vapor deposition processes.

Regarding Claim 33, Razeghi teaches method of forming a phototransistor that produces an internal gain upon being contacted with light within a receivable

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wavelength range, said method comprising: forming a collector (Fig. 1) comprising antimony on a substrate comprising antimony using a process such that said collector is substantially lattice matched to said substrate (claim 1); forming a base comprising antimony and having a collector-contacting portion in contact with a base-contacting portion of said collector using a process such that said base is substantially lattice matched to said collector; and forming an emitter comprising antimony and having a base-contacting portion in contact with an emitter contacting portion of said base using a process such that said emitter is substantially lattice matched to said base (claim1).

Regarding Claim 34, Razeghi teaches metal-organic chemical vapor deposition processes.

Regarding Claim 48, Razeghi discloses method of detecting light, comprising contacting a phototransistor as recited in claim 1 with light comprising at least a first wavelength, said first wavelength (Fig. 2) falling within said receivable wavelength range, and applying a current through said phototransistor, said current being amplified as a result of said light contacting said phototransistor.

Regarding Claim 49, in Fig. 2, Razeghi discloses infrared light.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-10, 25, 35, 36, 43-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Razeghi (6,452,242) in view of Taira (5,124,771)

Regarding Claims 3-10, 25, 35,36 and 43-45, Razeghi teaches a phototransistor comprising a substrate comprising antimony (column 2, lines 29-30), an emitter comprising antimony; a base comprising antimony, said base comprising an emitter-contacting portion which is in contact with a base-contacting portion of said emitter; and a collector comprising antimony, said collector comprising a base-contacting portion which is in contact with a collector-contacting portion of said base, said phototransistor producing an internal gain upon being contacted with light within a receivable wavelength range (column 5, lines 10-16). Razeghi fails to disclose the required composition of base, emitter and collector layers. However, Taira et al. disclose a semiconductor device where in Fig. 3; the required composition of the base, emitter, and the collector layers is disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required composition for emitter, collector and the base layers in Razeghi as taught by Taira in order to have a semiconductor device with improved saturation characteristics.

Regarding Claim 3, in Fig. 3 of Taira, emitter comprises GaSb

Regarding Claim 4, in Fig. 3 of Taira, base comprises GaSb

Regarding Claim 5, in Fig. 3 of Taira collector comprises GaSb

Regarding Claim 6, in Fig. 3, of Taira base 11/13 comprises a bandgap gradient defined between said emitter-contacting portion and said collector-contacting portion



thereof, said base bandgap gradient comprising a plurality of base bandgap values that decrease in a direction away from said emitter-contacting portion and toward said collector-contacting portion.

Regarding Claim 7, in Fig. 3 of Taira bandgap value at base contacting portion of emitter is greater than or substantially equal to a bandgap value of emitter-contacting portion of said base, and wherein a bandgap value at said base- contacting portion of said collector is less than or substantially equal to a bandgap value at said collector-contacting portion of said base.

Regarding Claim 8, in Fig. 3, of Taira, bandgap value at said base- contacting portion of emitter is greater than bandgap value at said emitter- contacting portion of said base.

Regarding Claim 9, in Fig. 3 of Taira, bandgap value at base- contacting portion of collector is less than bandgap value at said collector- contacting portion of base.

Regarding Claim 10, in Fig. 3 of Taira, base comprises at least a first base layer 11 and a second base layer 13 first base layer including said emitter-contact portion and comprising a first band gap value, second base layer including said collector-contacting portion and comprising a second bandgap value, first bandgap value, being greater than said second bandgap value.

Regarding Claim 25, in Fig. 3 of Taira the substrate is GaSb.

Regarding Claim 35, in Fig. 3 of Taira, buffer layers are GaSb based layers.

Regarding Claim 36, in Fig. 3 of Taira, contact layers are GaSb based layers.

Regarding Claim 43, in Fig. 3 of Taira, substrate is GaSb.

Regarding Claim 44, in Fig. 3 of Taira, 43, collector comprises InGaAsSb.

Regarding Claim 45, in Fig. 3, layer 13 is InGaAsSb.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to FAZLI ERDEM whose telephone number is (571)272-1914. The examiner can normally be reached on M-F 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/FAZLI ERDEM/  
Examiner, Art Unit 2826  
11/19/2009

/Thomas L Dickey/  
Primary Examiner, Art Unit 2826